

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A plasma processing apparatus comprising:
 - a plasma processing chamber having a plasma excitation electrode for exciting a plasma;
 - a radio frequency generator for supplying a radio frequency voltage to the electrode;
 - a radio frequency feeder connected to the electrode; and
 - a matching circuit having an input terminal and an output end, wherein the input terminal is connected to the radio frequency generator and the output end is connected to an end of the radio frequency feeder so as to achieve impedance matching between the plasma processing chamber and the radio frequency generator; and

wherein a set of electrical radio frequency factors of the plasma processing chamber are configured such that at an end of the radio frequency feeder a frequency, which is three times a first series resonant frequency f_0 of the plasma processing chamber, which is measured at the end of the radio frequency feeder is larger than a power frequency f_e of the radio frequency waves at the end of the radio frequency feeder, and

wherein the first series resonant frequency f_0 is determined by disconnecting the chamber from the rest of the system so that the chamber is in a non-discharge state and then measuring based on the measured impedance of the path from the feed plater radio frequency feeder to the ground via the a shaft and a variable oscillation frequency when the plasma processing chamber is disconnected from the matching circuit with an impedance meter while varying the oscillation frequency, and the first series resonant frequency f_0 corresponding corresponds to a minimum impedance of the plasma processing chamber, the minimum impedance evaluated with when the plasma chamber is disconnected from the plasma apparatus during a non-discharge period.

2. (Original) A plasma processing apparatus according to claim 1, wherein a frequency of 1.3 times the first series resonant frequency f_0 is larger than a power frequency f_e .

3. (Original) A plasma processing apparatus according to claim 2, wherein the first series resonant frequency f_0 is larger than three times the power frequency f_e .

4. (Previously Presented) A plasma processing apparatus according to claim 3, wherein a series resonant frequency f_0' which is defined by a capacitance between the plasma excitation electrode and a counter electrode for generating the plasma in cooperation with the plasma excitation electrode, is larger than three times the power frequency f_e .

5. (Original) A plasma processing apparatus according to claim 4, wherein the plasma excitation electrode and the counter electrode are of a parallel plate type, and the series resonant frequency f_0' and the power frequency f_e satisfy the relationship:

wherein d represents the distance between the plasma excitation electrode and the counter electrode, and δ represents the sum of the distance between the

$$f_0' > \sqrt{\frac{d}{\delta}} f_e$$

plasma excitation electrode and the generated plasma and the distance between the counter electrode and the generated plasma.

6. (Previously Presented) A plasma processing apparatus according to claim 1, further comprising a resonant frequency measuring terminal for measuring a resonant frequency of the plasma processing chamber, in the vicinity of the end of the radio frequency feeder.

7. (Previously Presented) A plasma processing apparatus according to claim 6, further comprising a switch provided between the radio frequency feeder

and the resonant frequency measuring terminal, wherein the switch electrically disconnects the end of the radio frequency feeder from the resonant frequency measuring terminal and connects the end of the radio frequency feeder to the output end of the matching circuit in a plasma excitation mode in which the plasma is excited, whereas the switch electrically connects the end of the radio frequency feeder to the resonant frequency measuring terminal and disconnects the end of the radio frequency feeder from the resonant frequency measuring terminal in a measuring mode in which the resonant frequency of the plasma processing chamber is measured.

8. (Original) A plasma processing apparatus according to claim 6, further comprising a resonant frequency measuring unit which is detachably connected to the resonant frequency measuring terminal.

9 – 62. (Cancelled)

63. (Previously Presented) A plasma processing apparatus comprising:

a plasma processing chamber having a plasma excitation electrode for exciting a plasma, a counter electrode, and a shower plate disposed between the plasma excitation electrode and the counter electrode;

a radio frequency generator for supplying a radio frequency voltage to the plasma excitation electrode;

a radio frequency feeder connected to the plasma excitation electrode; and

a matching circuit having an input terminal and an output end, wherein the input terminal is connected to the radio frequency generator and the output end is connected to an end of the radio frequency feeder so as to achieve impedance matching between the plasma processing chamber and the radio frequency generator,

wherein a frequency which is three times a first series resonant frequency f_0 of the plasma processing chamber which is measured at the end of the radio frequency feeder is larger than a power frequency f_e of the radio frequency waves, and

wherein the first series resonant frequency f_0 is determined by disconnecting the chamber from the rest of the system so that the chamber is in a non-discharge state and then measuring impedance of the path from the feed plate to the ground via the shaft with an impedance meter while varying the oscillation frequency, the first series resonant frequency f_0 corresponding to a minimum impedance of the plasma processing chamber, the minimum impedance evaluated with the plasma chamber disconnected from the plasma apparatus during a non-discharge period.

64. (Previously Presented) The plasma processing apparatus according to claim 1, wherein the plasma excitation electrode comprises an overlapping area with respect to the chamber wall, the overlapping area adapted to set the first series resonant frequency f_0 such that three times the first series resonant frequency f_0 is larger than a power frequency f_e supplied from the radio frequency generator.

65. (Previously Presented) The plasma processing apparatus according to claim 1, wherein the radio frequency feeder has a length adapted to set the first series resonant frequency f_0 such that three times the first series resonant frequency f_0 is larger than a power frequency f_e supplied from the radio frequency generator.

66. (Previously Presented) A plasma processing apparatus comprising:

a plasma processing chamber having a first series resonant frequency f_0 and a plasma excitation electrode for exciting a plasma;

a radio frequency generator for supplying a radio frequency voltage to the electrode;

a radio frequency feeder connected to the electrode; and

a matching circuit having an input terminal and an output end, wherein the input terminal is connected to the radio frequency generator and the output end is connected to an end of the radio frequency feeder so as to achieve impedance matching between the plasma processing chamber and the radio frequency generator,

wherein the first series resonant frequency f_0 corresponds to a minimum impedance of the plasma processing chamber, the minimum impedance evaluated with the plasma chamber disconnected from the plasma apparatus during a non-discharge period, and

wherein at least one of the shape of a feed plate, the overlapping area of the plasma excitation electrode and a chamber wall, insulation material between the plasma excitation electrode and the chamber wall, or the capacitance between a susceptor electrode and the chamber wall is adjusted such that three times the first series resonant frequency f_0 is larger than a power frequency f_e supplied from the radio frequency generator.

67. (Previously Presented) The plasma processing apparatus according to claim 66, wherein at least one of the shape of a feed plate, the overlapping area of the plasma excitation electrode and a chamber wall, insulation material between the plasma excitation electrode and the chamber wall, or the capacitance between a susceptor electrode and the chamber wall is adjusted such that 1.3 times the first series resonant frequency f_0 is larger than a power frequency f_e .

68. (Previously Presented) The plasma processing apparatus according to claim 67, wherein at least one of the shape of a feed plate, the overlapping area of the plasma excitation electrode and a chamber wall, insulation material between the plasma excitation electrode and the chamber wall, or the

Serial No.: 09/925,579

capacitance between a susceptor electrode and the chamber wall is adjusted such that the first series resonant frequency f_0 is larger than a power frequency f_e .

69 – 70 (Cancelled)